

IN THE SPECIFICATION:

Please add the following paragraphs:

[0047] Reference is now made to FIG. 2 of the drawings, which illustrates expansion apparatus 114 in accordance with a further embodiment of the present invention. The apparatus 114 shares many features with the apparatus described above, and operates in a broadly similar manner.

[0048] In addition to the leading and trailing seals 124, 126, swab cups 50 are provided ahead of the leading seal 124, which swab cups 50, in addition to a sealing function, serve to condition the inner surface of the casing 110 ahead of the seal 124, and also assist in stabilising the expansion cone 118.

[0049] The oscillator 122 is in the form of reciprocating piston pump, a rotary drive 52 being converted to axial movement of the pump piston 54 by an appropriate transfer arrangement 56, such as those described in WO 02/14028, U.S. Pat. No. 5,042,385, U.S. Pat. No. 5,513,709, the disclosures of which are incorporated herein by reference.

[0050] In one embodiment, Upward movement of the piston 54 draws fluid from the volume beyond the swab cup 50 into the piston cylinder 58 via a conduit 60 incorporating a one-way valve 62. Downward movement of the piston 54 pumps the fluid from the cylinder 58 through a further one-way valve 64 and then through a plurality of conduits 66 to fluid outlets 68 provided in the cone surface 120.

[0051] In use, the fluid pressure above the seal 124, that is the pressure between the seals 124, 126 and also above the trailing seal 126, is maintained at a base pressure corresponding to approximately 70% of the yield pressure of the casing 110, in this example this being around 3000 psi (the yield pressure of the casing 110 is 3700 psi). The oscillator 122 is then operated to pump fluid into the volume V02 between the seals 124, 126 to create short duration 4000 psi pressure pulses within the volume V02,

during which the fluid pressure in the small volume around the cone 118 exceeds the casing yield pressure. With each pressure pulse the casing 110 expands by a small degree, in this example, the expansion resulting in a 10 cc increase the volume V02.

[0052] A substantially constant weight or force is being applied to the cone 118, for example by provision of a downhole tractor coupled to the string, while the pressure in the volume V02 is pulsed, and at each pulse the cone 118 will advance a short distance to occupy the newly expanded casing 118. The main proportion of the expansion is a result of plastic deformation of the casing 110, while a smaller degree of deformation is elastic, such that the casing 110 will tend to contract to some extent with the decay of the pressure within the volume V02 from the peak pressure produced at each pulse. However, the cone angle is relatively shallow (the cone angle is shown somewhat exaggerated in the Figure) such that the cone 118 will tend to retain any elastic deformation. Thus, following completion of an expansion operation, it may be necessary to apply a tension to the cone 118 while the pressure in the volume V02 is being pulsed in order to remove the cone 118, if this is desired or necessary: in some cases the cone 118 may be left in the casing 110.

[0053] As will be apparent to those of skill in the art, the operation of the oscillator 122 combined with the application of weight to the cone 118 will result in relatively rapid expansion of the casing 110.